

sota Academy of Natural Sciences. The entire expense of the expedition was borne by Mr. Menage, and its results were donated to the Academy of Sciences." In the present brochure we have the first fruits of this praiseworthy enterprise, sustained by Mr. Menage. "During the stay of two years and five months in the Philippines" seventeen of the islands were visited. Reference is made to the "careful series of measurements of more than four thousand" specimens of birds, which will appear in their final report, taken for the purpose of showing "the relative amount of individual variation in the representatives of those genera which display a strong tendency to develop local species as compared with other genera which show no such tendency."

In the present preliminary paper 36 species of birds are described as new, and new localities are given for 226 species previously recorded from these islands. Important notes are given on some 40 species previously described from the Philippines, supplementing the previous more or less incomplete descriptions, or treating of questions of nomenclature, including remarks on the *Dicaeum trigonostigma* group as represented in these islands. The final report on the results of this important expedition will be awaited with interest. — J. A. A.

Merriam's Laws of Temperature Control of the Distribution of Land Animals and Plants.¹ — In his recent Vice-Presidential address before the National Geographic Society of Washington, Dr. Merriam has given the results of his long-continued investigations of the influence of temperature in controlling the distribution of animals and plants over the earth's surface. Investigations made by botanists tend to show that plants require a certain amount of heat — the amount varying of course with the species — to reach a given stage of development, as leafing, flowering, the maturation of seed, etc. This quantity is computed on the basis of the average temperature of each day which reaches the minimum required for the functional activity of the particular species in question. As Dr. Merriam states it, "the substance of this theory is that the same stage of vegetation is attained in any year when the sum of the mean daily temperatures reaches the same value, which value or total is essentially the same for the plant in all localities." Reasoning from this, Dr. Merriam observes: "If it is true that the same stage of vegetation is attained in different years when the sum of the mean daily temperatures reaches the same value, it is obvious that the *physiological constant of a species must be the total quantity of heat or sum of positive temperature required by that species to complete its cycle of development and reproduction.*" He has

¹ Laws of Temperature Control of the Geographical Distribution of Terrestrial Animals and Plants. Annual Address by Vice-President Dr. C. Hart Merriam. Nat. Geog. Mag., Vol. VI, 1894, pp. 229-238, pll. xii-xiv.

accordingly attacked not only the subject of the "species constant" but that of the "zone constant." "In conformity with the usage of botanists," he continues, "a minimum temperature of 6° C. (43° F.) has been assumed as marking the inception of the period of physiological activity in plants and of reproductive activity in animals. The effective temperatures or degrees of normal mean daily heat in excess of this minimum have been added together for each station, beginning when the normal mean daily temperature rises higher than 6° C. in spring and continuing until it falls to the same point at the end of the season. The sums thus obtained have been platted on a large scale map of the United States, and isotherms have been run which are found to conform in a most gratifying manner to the northern boundaries of the several life zones." The available data, though not so full as desirable, appear "to justify the belief that animals and plants are restricted in northward distribution by the total quantity of heat during the season of growth and reproduction."

The southern limit of distribution of species, however, must evidently be determined by some other cause, as, probably, a degree of heat greater than they are able to sustain. "The difficulty," as Dr. Merriam observes, "is in ascertaining the *length of the period* whose mean temperature acts as a barrier." This for the present he has "arbitrarily" assumed to be the "six hottest consecutive weeks of summer"; and on platting the mean normal of this period it is found to agree so closely "with the southern boundary of the Boreal region" "as to justify the belief that animals and plants are restricted in southward distribution by the mean temperature of a brief period covering the hottest part of the year."

Three maps accompany the paper, giving (1) the 'Distribution of the total quantity of Heat during Season of Growth and Reproductive Activity'; (2) 'Mean Temperature of Hottest Six consecutive weeks of the Year'; (3) 'Life Zones of the United States.' The boundaries limiting the temperature areas and the life zones are so nearly coincident that they are practically identical! The temperature observation stations are shown on the first two maps, and from their remote positions along some of the boundaries platted it is evident that these lines are to some extent tentative and hypothetical; yet it is not probable that they will be found far from their correct position when fuller data are secured.

Dr. Merriam's paper is not only a step in the right direction but a most important contribution to the subject in hand. The premises are in the main sound, but it is evident that no one temperature limit will fit all species as a point of departure for computing the species constant, reproductive activity, in many animals at least, beginning at a temperature far below 6° C., the "inception of reproductive activity" being often determined by a combination of circumstances having little to do with a definite temperature of 6° C., however different the case may be with plants.—J. A. A.